

to us very important indeed. In the present state of our knowledge of the subject a few such "trifling facts" are worth more than many volumes of ingenious speculation.

We come now to the more weighty question which formed the subject of Mr. Darwin's first letter. Is it probable that instincts have any other origin than transmission by inheritance of acquisitions resulting from what we call individual experience? We are here at the very outside edge of human knowledge, in a region where no prudent person would venture to speak with confidence. Indeed the mode of origin recognised in the question still appears a "wild theory" to such respectable representatives of educated opinion as the *Spectator*. Had it been our good fortune to know as matter of certain history that the well-marked instinctive antipathy towards butchers of the dog King and his descendants was originally produced by ill-treatment, we should have had evidence of the most positive and direct kind, that sometimes at least instincts do originate in this way. There seems no hope of getting such evidence in this particular case; and indeed it may well be that the instinct in question is much more ancient than Mr. Darwin seems inclined to suppose. It is however to be hoped that before long some lover of animals will try his hand at actually producing a new instinct. But while Mr. Darwin regards it as probable that most instincts are examples of inherited experience, he thinks it "almost certain that many of the most wonderful instincts have been acquired independently of habit, through the preservation of useful variations of pre-existing instincts. Other instincts may have arisen suddenly in an individual, and then been transmitted to its offspring, independently both of selection and serviceable experience, though subsequently strengthened by habit. The tumbler-pigeon is a case in point, for no one would have thought of teaching a pigeon to turn head over heels in the air; and until some bird exhibited a tendency in this direction, there could have been no selection." The authority of Mr. Spencer may be adduced in support of Mr. Darwin's position. He speaks of "the natural selection of incidental variations," and of feelings that cannot be referred to "the inherited effects of experiences." Nevertheless, let us look closely at this matter. Will Mr. Darwin's view bear to be stated in such a way as to express more than the fact that in a great many instances we cannot conceive how the instincts originated? Will it bear to be put in this form: that it is almost certain that many of the most wonderful instincts had their origin in useful variations or sudden conjunctions of psychical states of such a character as could not by possibility have any relation to the experiences either of the individual itself or of its ancestry? Anything short of this will, it seems to us, scarcely amount to the contention that instincts have a mode of origin distinct from experience and heredity. That some other factor of unknown power may work along with experience and heredity in producing instincts, we are not in a position to deny. But still less are we in a position to say that there is such a factor, or what that factor is, or to admit that it ever operates independently of experience and heredity. We do not know how the tumbling of the tumbler pigeon began. But suppose we were certain that we had witnessed the very first performance of this kind, and saw that it arose suddenly and

without any assignable cause: What then? How did the tumbling begin? To call it an incidental variation is but a way—and, because to some minds it looks like an explanation, a bad way—of stating our ignorance. But could we say so much as that it was in no way connected with experience and heredity? We think not. This tumbling is a fancy instinct, an outlet for the overflowing activity of a creature whose wants are all provided for without any exertion on its part. And if we had before us the evolutionary history of the pigeon we might be able to point to some long obsolete instinct or useful action and say, behold, when on the wing, the superabundant energy of the creature has burst along the old long disused but not obliterated tracks, and see the strange result.

This is the direction in which we think it would not be unscientific to look for an explanation, should we ever have any such facts to explain. A similar line of remark might be followed with respect to what Mr. Darwin calls useful variations of pre-existing instincts. The question is, whence these variations? Further, just in proportion as these variations are slight, must it be difficult to say that they are not connected with experience—with the experience of the individual. In pursuing this inquiry we should doubtless come on the question, What is meant by experience? Everybody, it may be said, surely knows that. Perhaps. It is, we think, probable that the discovery might be made that we have not very clear and well-defined ideas as to the exact nature, extent, and limits of what we call individual experience. Of course we cannot now enter on such an inquiry.

SEPULCHRAL MONUMENTS OF CORNWALL *

II.

Nenia Cornubia. A descriptive essay, illustrative of the Sepulchres and Funereal Customs of the early Inhabitants of Cornwall. By W. Copeland Borlase, B.A., F.S.A. (London: Longmans; Truro: Netherton, 1872.)

MR. BORLASE, assisted by a party of friends, early in 1872, opened two barrows on the summit of one of the most commanding elevations in the district, about a quarter of a mile east of Trevelgue or Trevelga Cliff Castle, near St. Columb Minor. The most westerly is 250 ft. in circumference, 11 ft. high at the centre, and its greatest axis, having an east and west direction, is 100 ft. At a depth of 2 or 3 ft. from the surface, the entire substratum, to the amount of several hundred cart-loads, was burnt earth, as red and almost as fine as brickdust. Beneath it and towards the eastern side was a cairn of stones about 12 ft. in diameter, and 4 ft. high. Many of them had been brought from the neighbouring beach, and were blackened by fire. Under this lay a large spar stone, such as does not occur in the district, singularly flat for a stone of the kind, measuring 10.5 × 5.4 × 1.75 ft., on a level with the surrounding country, and covering a chamber 6.16 ft. long from N.W. to S.E., 2.5 ft. broad, and 2.75 ft. deep. Its sides were formed of four slate stones, 7 or 8 in. thick, and set on edge, on each of which the covering stone rested. The floor seemed to have been paved with slates, but they had been displaced, and portions of an unusually thick human skull were found below them.

The eastern or more conspicuous barrow was 80 ft. in diameter, 13 ft. high, and had a depression of 1.5 ft. at

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the summit. Immediately under the turf was a bed of stones, 3 ft. deep, and lying on a stratum of hard clay brought from a neighbouring valley. It contained a few human bones and ashes without any protection, and was 5 ft. deep. Under this was a second layer of stones, 3 ft. deep; and lower still an immense slate stone on a level with the natural soil, and covering a vault measuring 5'17 ft. long from N.W. to S.E., 2'8 ft. broad, and 2'25 ft. deep. The bottom was a pavement 6 in. deep, on which lay a human skeleton on its left side. The head was at the north-east corner nearly a foot from the end wall; the legs were bent at the knees, the arms stretched out so that the hands must have, at least, nearly touched the knees, and the body was contracted into a length of 4 feet.

Mr. Borlase holds that the Menhirs, or "Long Stones," of which there are many in various parts of the county, were sometimes tombstones merely, sometimes memorials of important events, and that they ranged from a remote antiquity far down into modern times.

In the hope of throwing some light on their origin the author recently examined the ground immediately around them. The Pridden Stone, close to the farm-house of Pridden, in the parish of Buryan, near Penzance, is an extremely rude mass of granite, 11'5 ft. above the ground, nearly 20 ft. in girth where broadest, and tapering towards the top. Below the natural level of the ground, a shallow pit, covered with a flat stone a foot in diameter, contained a few splinters of human bones, charred wood, and a layer of burnt brownish mould, the whole not sufficient to fill a quart pot.

On the farm of Tresvennech, in the parish of Paul, near Penzance, stands a granite menhir on the summit of elevated ground 11'5 ft. above the surface, and 4 ft. below. Though unhewn it is tolerably square at the angles, symmetrical, and perfectly upright. In 1840, a farmer, working near it, accidentally struck his tool against a horizontal flat stone 18 in. square, beneath which was a pit cut out of the clay soil, having its sides unprotected, and containing an urn 19'4 in. high, and 14'3 in. wide at the mouth. It stood mouth upwards, and contained the larger fragments of the calcined bones, and a molar tooth, of a human body; whilst the smaller pieces, together with wood ashes, were scattered throughout the pit. The urn was hand-made, and consisted of yellow clay found in the vicinity. Its interior was hard and black, but the exterior was not well baked. The handles were remarkably large and neatly put on, but differed in shape and size. A smaller urn, 5'5 in. high and 4 in. wide at the mouth, found 18 inches from the former, was also standing on its base, but without protection of any sort. It was filled with snuff-coloured powder.

The Sepulchral Mounds, or Barrows of Cornwall, whether of earth or stones, range from 15 to 100 ft. in diameter, and from 2 to 25 ft. in height. They resolve themselves into Cone, Bowl, Bell, Flat, and Ring barrows, but there is no instance of the Long, Druid, Egg, or Twin form, *i.e.* two surrounded by the same trench. The author recognises two pretty well-defined varieties of Ring-barrow:—1. Where the stones stand *on end*, at some distance from each other, and enclose only a piece of level ground. 2. Where the stones are set *on edge* (rarely *on end*) contiguous to each other, and enclose either a

large rock, a few small mounds, or an area of uneven ground.

Of the first kind, there are four distinct examples within a circuit of eight miles in the Hundred of Penwith. Mr. Borlase is of opinion that all circles of *erect* stones owe their origin to the same design which attained its perfection in Stonehenge, and that the only question remaining is how far they can be regarded as sepulchral in their origin or use. He remarks that whatever may have been their *origin*, history and tradition seem to point rather to a civil than a religious *use* of them, and in confirmation quotes the "Iliad" (xviii. 503), a passage thus translated by Mr. Wright:—

"Heralds the people checked. Elders meanwhile
On polished stones in sacred circle sate."

The *Ring Barrows* of the second variety range from 10 to 100 ft. in diameter. The author has little doubt that they were originally sepulchral, and that they are cairns or barrows in an incomplete or demolished state.

At Trigganeris, in the parish of Sancreed, on the top of a hill, are two erect stones 17 ft. apart in a direction from N.N.W. to S.S.E., 7'3 ft. and 9 ft. high respectively. Nearly midway between them, but entirely on one side of a line joining their centres, a grave, 6 ft. long in an almost east and west direction, 3'25 broad, and about 5 ft. deep, was found cut with much precision in the natural clay. It contained nothing but the disturbed fine subsoil of the neighbourhood.

In 1818, a grave 8 ft. long, 3'5 broad, and 3 high, was found under a pile of stones 30 yards in diameter, near the "Cheesewring," in the parish of Linkinghorn, in East Cornwall. The bottom was one long flat stone; each side consisted of three stones, each end of one, and it had a cover of a single stone. Within it lay the remains of a human skeleton extended, having near the breast an earthen pot, containing, according to the workman who found it, a golden cup. The vessels were covered and protected with a flat stone 16 inches square, which leaned diagonally over them against the west wall of the grave. In this grave the following relics were also found, but subsequently lost:—a small piece of ornamental earthenware, a bronze spear head 10 in. long, a metallic rivet, as is supposed, and a few glass beads. The gold cup has been preserved, and is 3'75 in. high, 3'375 in. in diameter at the mouth, 2'5 ounces in weight, and its bullion value is 10*l*. It is perhaps worthy of remark that before the discovery of the cup there was a tradition in the neighbourhood of a "golden boat" having been dug up in a stone cairn near the Cheesewring.

It does not appear necessary to attach a nautical meaning to the word *boat*, for, unless we are in error, vessels for containing melted butter, sauce, &c., were formerly termed *boats* in Cornwall, as well as elsewhere.

Before quitting this cup it may be as well to add that we have elsewhere seen 1837 mentioned as the date of the discovery, instead of 1818, as given by Mr. Borlase.

Well-authenticated instances of inhumation are stated by the author to be extremely rare in Cornwall, and amongst these only two or three examples of the extended position actually occur, whilst only one of the contracted position can really be cited. He inclines to the opinion that the British copied the practice of cremation at a period not earlier than that of their con-

tact with the Romans; and thinks that a very doubtful answer must be given to the question, "Have there been found in Cornwall any interments which can with some certainty be said to have preceded the practice of cremation?"

Mr. Borlase entirely dissents from the opinion that articles interred with the deceased had reference to any view of utility in the next world, or, in other words, that they are the result of a matured belief in a future state; but guards himself from being supposed to assert that such a belief was non-existent in the days of the barrows.

The large *sepulchral urns* are of two kinds. 1. *Vase-shaped* vessels from 10 to 20 inches high, ribbed round the upper part, sometimes ornamented with small indentations, but never with the chevron pattern. 2. *Barrel-shaped* vessels from 8 to 13.5 inches high, invariably ornamented with the chevron pattern.

Vessels differing from the foregoing in size only, and ranging from 4.5 to 6 inches in height, are very frequently found in Cornish barrows, and sometimes in close proximity to the large ones.

Mr. Borlase has compiled, from county histories, papers read to various societies, manuscripts of older antiquaries—especially Dr. Borlase—and his own note-book, a detailed account of explorations and discoveries in the Cornish tumuli, made at different periods, from Norden's account in 1584, of "an antient buriall at Withiell," to his own researches at Pradannack in November 1871. It may be doubted whether any part of his interesting volume exceeds this in value; and we indulge the hope that others—not antiquaries only—may follow his example, and collect and record the researches that have been made in the departments to which they specially devote themselves, in the counties in which they reside. We should greatly like to linger over this chapter, but both time and space forbid us to do more—and this we do most cordially—than congratulate the author on the successes which have attended his explorations.

He devotes his last chapter to "The Age of the Monuments," and thinks that his discoveries justify the conclusion that some, at least, of the most typical of the interments might be brought within historic times, and assigned to the early centuries of the Christian era.

The facts which seem chiefly to delight him are those he discovered in 1863, on Morvah Hill, and of which he gives, as "most worthy," the following "second notice":—

"Here was an instance of an interment in a cairn, where the body had been burnt on a central natural work surrounded by the usual ring of stones, the ashes placed in an urn of the usual chevron pattern, accompanied by the usual limpet and flint, protected by the usual Kist-Vaen, and finally covered in by the usual pile of stones. The whole arrangement, in short, being one of the most typical examples of the generality of barrows opened in the district. But here, in the very Kist itself, what should appear but late Roman coins of the third century! What is the most natural inference, then? That the coins must be thrown out of the question, because of the flint chip? or the whole structure referred at once to the Stone Age, thousands of years B.C., because it is encircled by large stones, or because the pottery is rude, and its ornamentation not curvilinear? Is it not rather the only fair course to admit at once that this interment, although

possessing every characteristic of the so-called Stone Age, was placed here not earlier than the third century, A.D., that is, at the time when the coin was struck?" (pp. 263-4).

Being ignorant, perhaps, of some of the facts of the case, we do not presume to say that the author has not correctly interpreted his case, but as he seems resolved to ignore the question of secondary interments, which have undoubtedly taken place in many instances, and for aught that appears, may have occurred at Morvah, we hold *non proven* to be at present the only safe verdict.

We cannot take leave of Mr. Borlase's work without thanking him for the numerous well-executed illustrations with which it is enriched, and congratulating the publisher on the manner in which it has been got up.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

New Experiments on Abiogenesis

HAVING occupied myself for some time past with an experimental study of abiogenesis, I have followed with much interest the controversies on that question in recent numbers of NATURE, and beg leave therefore to state to the readers of this journal the results of my experiments, which form in my opinion a not unimportant contribution to the solution of the interesting problem.

I fully agree with Prof. Burdon Sanderson in the confirmation of Dr. Bastian's statements regarding the well-known turnip-and-cheese experiments. A turnip decoction of the specific gravity 1.011—1.016, filtered and boiled with cheese (0.25—0.5 gm. to 50 c.c.), filtered again and neutralised, then boiled for 10 minutes and hermetically sealed, is after 2—3 days' exposure to a temperature of 30° C. swarming with *Bacterium termo*. It is however to be remarked that a too great concentration of the solution hinders the evolution of the Bacteria; the volume of the liquid employed should therefore not be too small, otherwise the boiling for 10 minutes will render the solution too much concentrated. Perhaps the negative results recorded by some experimenters are to be explained in this way.

Both turnip-decoction and cheese are a mish-mash of substances for a great part ill-defined and imperfectly known. It would be desirable to substitute for these materials some other mixture of better defined ingredients.

Instead of cheese can be used peptone (0.2 gm. to 50 c.c.) with the same result. The peptone is obtained by digestion of egg-albumen with artificial gastric juice, subsequently isolated and purified by repeated precipitation with alcohol.

In searching for a substitute for the turnip-decoction I found it available not to use the hermetically sealed vessels, but to experiment with free admittance of air. The recent explorations of Cohn, Burdon Sanderson, and Rindfleisch have shown that the germs of Bacteria are but sparingly present in common air, but notwithstanding it is a matter of course that in these experiments no other but perfectly filtered air can be admitted. After many trials the following mode of experiment was finally adopted.

I prepared a solution of the mineral salts, that are according to Cohn indispensable to the nutrition of Bacteria, viz. 1 gm. potassium nitrate, 1 gm. magnesium sulphate, 0.2 gm. calcium phosphate to 500 c.c. distilled water. (This mixture does not quite agree with the solution employed by Cohn. For various reasons, which will be stated elsewhere in a more extensive report of my experiments, I preferred this modification.) In 100 c.c. of this liquid were dissolved 2.5 grms. grape-sugar and 0.4 gm. peptone. About 50 c.c. of this solution was poured into a glass flask holding about 100 c.c. The mouth of this flask was beforehand polished flat, and a layer of hot molten asphalt laid on the flat brim. The liquid in the flask was then boiled for ten minutes over an ordinary Argand burner. The excessive frothing of the boiling liquid is easily prevented by using a small flame, and carefully regulating it when the froth is on the point of coming up, yet without allowing the liquid to